APPENDIX G

MATRIX DIFFUSION REPORT

Rock Core Sampling and Analysis at the Foster Wheeler Energy Corporation/ Church Road TCE Site Mountain Top, Luzerne County, PA

DATA REPORT

102537-R

SEPTEMBER 27, 2011

CORE DFN™

DISCRETE FRACTURE NETWORK APPROACH

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STONE ENVIRONMENTAL INC

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1. INTRODUCTION

Stone Environmental, Inc. (Stone) was retained by Tetra Tech EC, Inc. (Tetra Tech) to support a program of rock core sampling and laboratory analysis at the Foster Wheeler Energy Corporation/ Church Road TCE Site Mountain Top, Luzerne County, PA. The purpose of this work was to assess the distribution of chlorinated volatile organic compounds (VOCs) within the bedrock matrix at one corehole location designated MD-01. The location of this corehole was selected by Tetra Tech.

Sampling was conducted during drilling of corehole MD-01 on August 23, 2011. A total of 50.3 linear feet of rock core was retrieved from the 51.5 linear feet cored at MD-01. A total of 44 rock samples were collected for VOC analysis. In addition three field duplicate samples, two MS/MSD samples, two equipment blank samples, two methanol blank samples, and two trip blank samples were also collected for VOC analysis. Four intact core samples were collected for physical property analyses (bulk density, porosity and fraction of organic carbon). Extraction and VOC analyses of the rock core samples were conducted at the Stone laboratory in Barre, VT between September 7 and 9, 2011.

Results of physical property analyses for bulk density, porosity and organic carbon content were used in conjunction with the VOC data for the calculation of rock pore water concentrations, as presented in this report. A full description of the methods used for the estimation of pore water concentrations is contained in Section 4.1 of this report.

2. FIELD SAMPLE COLLECTION METHODS

The following is a summary of the field methods used for drilling, rock sample collection, and processing during the field program. The sampling was undertaken by three Stone staff members working in concert with a Tetra Tech geologist who logged the core and directed drilling operations. Subsequent to the sample collection, Stone performed extraction and analysis of the VOC subsamples at the laboratory in Barre, VT.

2.1. Drilling and Core Collection

Drilling at MD-01was conducted on August 23, 2011 by Parratt-Wolff, Inc. of East Syracuse, New York. Bedrock was encountered at approximately 43.5 feet below ground surface (bgs). Coring was conducted using a HQ-sized core barrel generating 5-foot long by 2 ½-inch diameter cores. A triple-tube core barrel was utilized to minimize disturbance to the core. Core samples were retained within a second inner stainless steel tube, split lengthwise, within the inner tube. The split tube was extruded from the outer core barrel after each core run using water pressure. One half of the split tube was then removed to expose the core sample. This method was used as it limits the disturbance and mechanical breaks of the core samples, and provides cores that better reflect the *in situ* fracture distribution. A Tetra Tech geologist supervised the progression of drilling and terminated drilling at the corehole locations upon reaching a target depth of 90.5 ft bgs. Table 1, attached, summarizes the drilling progression and the number of samples collected.

2.2. VOC Sample Collection and Processing

Immediately following retrieval, the core was transferred from the split tube to a PVC tray lined with aluminum foil. The PVC tray was placed on a table in the vicinity of the drill rig, where the core was logged by a tetra Tech geologist and sampled by a Stone geologist. Two PVC trays were utilized; aluminum foil was disposed of between uses. Sample locations were selected for VOC analysis based on fracture distributions and lithology with a target frequency of approximately one sample every foot. Prior to sampling, the core was photographed with labels indicating the site name, corehole name, run number, depth bgs of the top and bottom of the run, and Recovery. Samples were collected both from fracture surfaces and from the intervening unfractured rock matrix. Samples approximately 0.1 feet thick were broken from the core using a hammer and chisel at the selected sample depths. The samples were then immediately wrapped in aluminum foil, placed in a zip top poly bag and given a unique field ID. Immediately following sampling and wrapping, the samples were delivered to the sample processing area, which was located in the vicinity of the sampling table inside a Stone data acquisition vehicle. Details on sample depths, collection times, position relative to fractures, and other relevant information were recorded on forms in Stone's CORE^{DFN} field database. After completion of geologic logging and sample collection the remainder of the core was transferred into wooden core boxes for future reference.

Immediately after samples arrived at the processing area, samples were unwrapped and placed in individual stainless steel trimming cells, where the outer portion of the sample (that had been exposed to drill tooling) was removed with a hammer and chisel. The remaining subsample was then placed in a sealed stainless steel cell and crushed using a hydraulic press. Subsamples were crushed under a pressure of approximately 6,000 psi. The crushed subsample was then immediately transferred to a pre-labeled 40-mL VOA vials containing 15- mL of purge-and-trap grade methanol.

Trimming cells, crushing cells, chisels, and all other equipment associated with sample processing were decontaminated between each subsample. Stone provided 5 sets of trimming cells, crushing cells, and chisels enabling staff to process all samples from a given run before starting the five step decontamination process. The five step decontamination process involves: 1) full immersion in phosphate free detergent wash with scrubbing to remove sediment; 2) full immersion in distilled water; 3) spray rinse with clean wash-grade methanol; 4) spray rinse with clean distilled water to remove any traces of methanol; and 5) drying with clean/disposable towels before next use. Equipment Blanks (EBs) were collected at the beginning of each day and at a minimum of every 20th sample. To collect EBs Kim-wipes were removed from a pre-prepped and pre-labeled vial containing 15 mL of purge-and-trap grade methanol then used to wipe the inside of decontaminated crushing cells and other equipment that had come in contact with subsamples. Kim-wipes were then replaced into the pre-labeled vials they were taken from. EBs were analyzed for VOCs.

Sample vials were prepared in the field at the beginning of the day that field upon which work was conducted. Vials were labeled and weighed before the addition of methanol, after the addition of 15 mL of purge-and-trap grade methanol, and again after the addition of crushed rock. Calibration of the balance was checked prior to use and was found to be accurate. Sample vial IDs were cross-referenced with the field ID, which in turn references a sample depth. Sample depths were used to generate client sample IDs. Each sample was labeled with its client sample ID then packaged for storage and transport to the Stone laboratory in Barre, VT. For sample storage and transport VOA vials screw caps were wrapped with Teflon tape. Vials were then wrapped individually with bubble wrap and placed in a seal top poly bag. Samples were kept in coolers on ice and transported under Chain of Custody (COC) to the Stone lab upon completion of drilling activities on August 23, 2011 where they were stored in a temperature verified freezer until being extracted and analyzed for VOCs.

In total, 44 samples were collected for VOC analysis from 50.3 ft of rock retrieved for an average sample spacing of 1.14 ft. Three field duplicates (> 5%) were collected by crushing additional mass of selected field samples. Two MS/MSD samples were collected by crushing additional mass of selected field samples. Two methanol blanks (MB) were collected from the three 1-L bottles of purge-and-trap grade methanol used to prepare 40 mL VOA vials. MB were stored separately from all other samples. MB are used to determine possible contamination in the methanol used to preserve and extract samples.

2.3. Physical Property Sample Collection

Four intact core samples, 0.5-ft long, were collected from the cores for analysis of physical properties (porosity, bulk density, percent moisture, and total organic carbon). Physical property samples were not collected until after VOC sample collection was completed for a given run. Details about lithology, grain size, sample depth interval, and other relevant information were recorded in forms on Stone's CORE^{DFN} field database. Samples were wrapped first with saran wrap, then foil, and then sealed with laboratory parafilm to limit moisture loss. For shipping each sample was individually bubble wrapped and shipped on ice under COC to Golder Associates in Mississauga, Ontario for analysis. A summary of the samples collected for these physical property analyses are presented in Table 2, attached, and the results of these analyses are presented in Table 3, attached.

3. LABORATORY ANALYSIS AND VOC EXTRACTION

Sample extraction and analysis were performed September 7 to September 9, 2011at the Stone laboratory in Barre, VT. Microwave assisted extraction (MAE) was used for VOC mass extraction into the methanol. The methanol extracts were analyzed for nine target VOCs: Tetrachloroethene (PCE), cis 1,2-Dichloroethene (c-DCE), trans-1,2-Dichloroethene (trans-1,2-DCE), Carbon Tetrachloride (CT), Chloroform (CF), 1,1,1 Trichloroethane (1,1,1-TCA), 1,1- Dichlorothene (1,1 -DCE), 1,1,2-Trichlor-1,2,2-Trifluoroethane (CFC-113), and Trichloroethene (TCE).

Reporting limits (RL) for all analytes ranged from 0.61 to 20 ug/L in methanol extract. One quality assurance/quality control (QA/QC) measure associated with these analyses was observed to be outside the tolerance set forth in the associated laboratory Standard Operating Procedures (SOPS) and the NELAC standards. CT was detected above the RL in one trip blank (TB-02). However CT was not detected above the RL in any of the VOC samples so this minor QA/QC deficiency does not have any impact on the sample results for rock VOC samples. All other QA/QC measures associated with these analyses were found to be within the tolerances set forth in the associated SOPS and the NELAC standards. A full laboratory report is included in Appendix A.

4. RESULTS

The following sections provide the results of the rock core chemical analyses and a discussion of the method of estimation of pore water concentration.

4.1. Rock Core VOC Results and Pore water Estimates

A summary of rock core sample depths and VOC results are provided in Table 4, attached, and Estimates of porewater concentrations are provided in Table 5, attached.

The concentrations of the analytes extracted into methanol (C_{MEOH}) were measured using GC/µECD methods as µg/L in methanol. The concentration of analytes in the bulk rock (C_t) sample was then calculated using the analysis of the methanol extract (C_{MEOH}), mass of crushed rock in sample (M_{rock}) and volume of methanol (V_{MEOH}) as follows:

$$C_t = \frac{C_{MeOH} x V_{MeOH}}{M_{rock}}$$

This calculation reflects VOC mass present in dissolved, sorbed, and immiscible phases. Sample RLs can be calculated for each sample from the above equation by setting the C_{MEOH} to the respective values for each analyte; for samples where analyte concentrations are between the MDL and the RL, an estimated value has been assigned and the results flagged with a "J"; samples flagged with a "B" designation indicate contamination in the blank associated with the sample.

The bulk rock VOC concentrations (C_t) are converted to matrix pore water concentrations (C_w) in µg/L of pore water utilizing the wet rock bulk density in g/cm^3 ($\rho_{b(wet)}$), the dry rock bulk density ($\rho_{b(dry)}$) in g/cm^3, matrix porosity, a unitless factor (Φ), and the soil-water partitioning coefficient (K_d) in mL/g as shown below:

$$C_w = \frac{C_{t\,Pb(wet)}}{KdPb(dry)+\emptyset}$$

This equation assumes that the matrix porosity (i.e., primary porosity) is 100% saturated with water and that the VOC mass occurs in only the dissolved and sorbed phases (i.e., no NAPL is present). Porewater concentrations that approach or exceed aqueous solubility limits for a given compounds may indicate the presence of DNAPL (Feenstra et al, 1991).

The partitioning coefficient (k_d)is based on the assumptions that sorption is rapid, reversible and that there is no variation with concentration. This coefficient is calculated using the organic carbon portioning coefficient (K_{oc}) for each compound, obtained from the literature (e.g. Pankow and Cherry, 1996 and US

EPA, 1999), and fraction of organic carbon (f_{oc}) obtained through physical property analysis using the following equation:

$$K_d = K_{oc} f_{oc}$$

This coefficient assumes that sorption is entirely dependent upon solid phase organic carbon in the rock matrix, this being a reasonable assumption for the low molecular weights of the chlorinated ethenes of interest (Schwarzenbach et al. 1993).

Physical parameter tests were conducted by Golder Associates. Full laboratory reports for these analyses are provided in Appendix B. Physical properties samples were all representative of the Duncannon member of the Catskill Formation therefore the average values for porosity (Ø) bulk density (ρ_b), and fraction of organic carbon (f_{oc}) were used to estimate matrix porewater concentrations. Physical property data is provided in Table 2, attached.

The organic carbon portioning coefficient (K_{oc}) for each compound was obtained from Pankow and Cherry (1996), with the exception of 1,1,2-Trichlor-1,2,2-Trifluoroethane, which was obtained from an EPA reference (United States EPA, 1999). Table A, below, summarizes the (K_{oc}) values used to calculate matrix porewater concentrations.

Table A Organic Carbon Portioning Coefficients

Volatile Organic Compound	K_{oc} Value (mL/g)
Tetrachloroethene	364
cis-1,2-Dicholorothene	86
trans-1,2-Dichloroethene	59
Carbon Tetrachloride	439
Chloroform	44
1,1,1-Tricholoroethane	152
1,1-Dichloroethene	65
1,1,2-Trichlor-1,2,2-Trifluoroethane	372
Trichloroethene	126

VOC concentrations in rock (as ug/Kg) are shown in Table 4. Estimated pore water concentrations for each sample are shown in Table 5. These concentrations were calculated using the porosity (Ø), bulk

density (ρ_b), and fraction of organic carbon (f_{oc}) as reported by Golder Associates for each separate physical property sample.

4.2. Results from Field Blanks and Duplicates

Field blank results, including equipment blanks (EBs), methanol blanks (MBs), wash grade methanol blanks (WB), and trip blanks (TBs), are provided with the Analytical Report in Appendix B and summarized in Table 6, attached. No analytes were detected above their respective reporting limits in the field blanks, with the exception of TB-02, which had a detection of 3.1 µg/L of CT. No rock VOC samples had detections of CT above the method detection limit (MDL), so this blank contamination does not affect any of the rock VOC results.

Comparisons for the three field samples with corresponding field duplicate samples are provided in Table 7, attached. Two of the field samples and their corresponding duplicates had no detections above the MDL for all analytes. Field sample MD-01-68.40-VOC had a detection of TCE above the MDL, however its corresponding duplicate sample did not have a detection of TCE above the MDL. Variability in the % RPD can be largely attributed to the difficulty in collecting true duplicates, given the spatial variability in concentrations and rock matrix properties expected at the scale of sub-sampling. Field duplicates also test and reflect the repeatability of the entire sample-processing, extraction and analytical procedures, and thus are expected to show more variability than lab duplicates

5. REFERENCES

Feenstra, S., D.M. Mackay and J.A. Cherry. 1991. A method for assessing residual NAPL based on organic chemical concentrations in soil samples. Ground Water Monitoring Review, 11, 128-136.

Pankow, J.F. and J.A. Cherry. 1996. Dense Chlorinated Solvents and other DNAPLs in Groundwater. Waterloo Press, Portland, Oregon.

Schwarzenbach, R., P. Gschwend, and D. Imboden. 1993. Environmental Organic Chemistry. John Wiley and Sons Inc., New York.

USEPA (1999). USEPA Contract Laboratory Program, National Functional Guidelines for Organic Data Review, EPA540/R-99/008, October 1999.

TABLES

CORE DFN™ DISCRETE FRACTURE NETWORK APPROACH

Table 1 Summary of Drilling Progression and Samples Collected

Field Location	Core Run	Date (dd/mm/yy)	Depth From (ft bgs)	Depth to (ft bgs)	Core Run Length (ft)	Recovery (ft)	# Field VOC Samples	# Field VOC Duplicates	# Field VOC MS	# Field VOC MSD	# Physical Property Samples
MD-01	1	8/23/2011	43.5	45.5	2	2	2	0	0	0	0
MD-01	2		45.5	50.5	5	5	5	0	0	0	1
MD-01	3		50.5	55.5	5	4.3	4	0	0	0	0
MD-01	4		55.5	60.5	5	5	5	0	0	0	0
MD-01	5		60.5	65.5	5	5	4	0	0	0	0
MD-01	6		65.5	70.5	5	5	5	1	1	1	0
MD-01	7		70.5	75.5	5	5	4	0	0	0	1
MD-01	8		75.5	80.5	5	5	4	0	0	0	0
MD-01	9		80.5	85.5	5	5	4	0	0	0	1
MD-01	10		85.5	90.5	5	5	4	1	1	1	1
MD-01	11		90.5	95	4.5	4	3	1	0	0	0
				Totals	**51.5**	**50.3**	**44**	**3**	**2**	**2**	**4**

Table 2 Summary of Physical properties Samples Collected

Sample Name	Date Collected (dd/mm/yy)	Core Run	Core Run Interval (ft bgs)	Sample Interval (ft bgs)		Sample Mid-Depth (ft bgs)	Sample Length (ft)
MD-01-47.80-48.30-PHY	8/23/2011	2	45.5 - 50.5	47.80	48.30	48.05	0.5
MD-01-73.90-74.40-PHY	8/23/2011	7	70.5 - 75.5	73.90	74.40	74.15	0.5
MD-01-84.20-84.70-PHY	8/23/2011	9	80.5 - 85.5	84.20	84.70	84.45	0.5
MD-01-88.50-89.00-PHY	8/23/2011	10	85.5 - 90.5	88.50	89.00	88.75	0.5

Notes: Samples submitted to Golder Associates for physical parameter testing (porosity, percent moisture, and bulk density)

Table 3 Results of Physical Properties and TOC Measurements

Sample ID	Sample Interval (ft bgs)		Lithology Description	Porosity (-)	Water Content (%)	Wet Bulk Density (g/cm^3)	Dry Bulk Density (g/cm^3)	Specific Gravity (-)	TOC (%)[1]
	Top Depth	Bottom Depth							
MD-01-47.80-48.30-PHY	47.8	48.3	Duncannon sandstone	0.09	3.10	2.61	2.53	2.77	0.01
MD-01-73.90-74.40-PHY	73.9	74.4	Duncannon sandstone	0.05	1.60	2.73	2.69	2.83	0.035
MD-01-84.20-84.70-PHY	84.2	84.7	Duncannon sandstone	0.03	0.40	2.69	2.68	2.77	0.01
MD-01-88.50-89.00-PHY	88.5	89	Duncannon sandstone	0.04	0.30	2.62	2.61	2.73	0.11
			Minimum	0.03	0.30	2.61	2.53	2.73	0.01
			Maximum	0.09	3.10	2.73	2.69	2.83	0.11
			Average	0.05	1.35	2.66	2.63	2.78	0.041

Notes:

[1]Two determinations of TOC were reported by Golder associates for MD-01-73.90-74.40-PHY and MD-01-88.50-89.00-PHY. Table 3 reports the average value.

CORE DFN™ DISCRETE FRACTURE NETWORK APPROACH

Table 4: Total VOC Concentrations in Rock Core Samples

						Comments/Interpretation			[VOLATILE ORGANIC COMPOUNDS IN ROCK] (ug/kg of rock)																							
			Depth from	Depth to	Avg. Depth																											
Sample ID	Location ID	Interval (ft bgs)	ft	ft	(ft bgs)	Sample Lithology (3a)	Position Relative to Fracturing (3b)	Fracture Type (3c)	Tetrachloroethene			cis-1,2-Dichloroethene			*trans-1,2-Dichloroethene*			*Carbon Tetrachloride*			Chloroform			1,1,1-Trichloroethane			1,1-Dichloroethene			1,1,2-Trichlor-1,2,2-Trifluoroethane			Trichloroethene		
MD-01-43.80-VOC	MD-01	43.5 - 45.5	43.8	43.9	43.85	Duncannon formation	AF	HF	1.0	U		9.7	U		9.7	U		1.0	U		0.97	U		1.0	U		9.7	U		1.0	U		80		
MD-01-44.40-VOC	MD-01	43.5 - 45.5	44.4	44.5	44.45	Duncannon formation	BET	HF	0.7	U		7.3	U		7.3	U		0.7	U		0.73	U		0.7	U		7.3	U		0.7	U		310		
MD-01-46.10-VOC	MD-01	45.5 - 50.5	46.1	46.2	46.15	Duncannon formation	BET	NA	0.8	U		8.3	U		8.3	U		0.8	U		0.83	U		0.8	U		8.3	U		0.8	U		72		
MD-01-46.90-VOC	MD-01	45.5 - 50.5	46.9	47	46.95	Duncannon formation	AF	HF	0.7	U		6.7	U		6.7	U		0.7	U		0.67	U		0.7	U		6.7	U		0.7	U		43		
MD-01-47.70-VOC	MD-01	45.5 - 50.5	47.7	47.8	47.75	Duncannon formation	AF	HF	0.8	U		7.7	U		7.7	U		0.8	U		0.77	U		0.8	U		7.7	U		0.8	U		63		
MD-01-48.70-VOC	MD-01	45.5 - 50.5	48.7	48.7	48.70	Duncannon formation	BF	ANG	0.9	U		9.2	U		9.2	U		0.9	U		0.92	U		0.9	U		9.2	U		0.9	U		53		
MD-01-50.20-VOC	MD-01	45.5 - 50.5	50.2	50.3	50.25	Duncannon formation	AF	HF	0.9	U		9.1	U		9.1	U		0.9	U		0.91	U		0.9	U		9.1	U		0.9	U		110		
MD-01-51.50-VOC	MD-01	50.5 - 55.5	51.5	51.6	51.55	Duncannon formation	AF	HF	0.9	U		8.8	U		8.8	U		0.9	U		0.88	U		0.9	U		8.8	U		0.9	U		43		
MD-01-52.80-VOC	MD-01	50.5 - 55.5	52.8	52.9	52.85	Duncannon formation	BF	ANG	0.8	U		7.7	U		7.7	U		0.8	U		0.77	U		0.8	U		7.7	U		0.8	U		38		
MD-01-53.50-VOC	MD-01	50.5 - 55.5	53.5	53.6	53.55	Duncannon formation	F3	NA	0.9	U		8.7	U		8.7	U		0.9	U		0.87	U		0.9	U		8.7	U		0.9	U		36		
MD-01-54.30-VOC	MD-01	50.5 - 55.5	54.3	54.4	54.35	Duncannon formation	AF	HF	1.0	U		10	U		10	U		1.0	U		1.0	U		1.0	U		10	U		1.0	U		28		
MD-01-56.50-VOC	MD-01	55.5 - 60.5	56.5	56.6	56.55	Duncannon formation	BF	HF	0.9	U		8.7	U		8.7	U		0.9	U		0.87	U		0.9	U		8.7	U		0.9	U		42		
MD-01-57.40-VOC	MD-01	55.5 - 60.5	57.4	57.5	57.45	Duncannon formation	BF	HF	0.8	U		7.8	U		7.8	U		0.8	U		0.78	U		0.8	U		7.8	U		0.8	U		66		
MD-01-58.40-VOC	MD-01	55.5 - 60.5	58.4	58.5	58.45	Duncannon formation	BET	HF	0.6	U		6.1	U		6.1	U		0.6	U		0.61	U		0.6	U		6.1	U		0.6	U		13		
MD-01-59.50-VOC	MD-01	55.5 - 60.5	59.5	59.6	59.55	Duncannon formation	F6	NA	0.7	U		6.7	U		6.7	U		0.7	U		0.67	U		0.7	U		6.7	U		0.7	U		15		
MD-01-60.00-VOC	MD-01	55.5 - 60.5	60	60.1	60.05	Duncannon formation	BF	HF	0.8	U		8.2	U		8.2	U		0.8	U		0.82	U		0.8	U		8.2	U		0.8	U		21		
MD-01-61.40-VOC	MD-01	60.5 -65.5	61.4	61.5	61.45	Duncannon formation	NA	NA	0.8	U		8.1	U		8.1	U		0.8	U		0.81	U		0.8	U		8.1	U		1.2			71		
MD-01-62.50-VOC	MD-01	60.5 -65.5	62.5	62.6	62.55	Duncannon formation	BF	ANG	0.7	U		6.6	U		6.6	U		0.7	U		0.66	U		0.7	U		6.6	U		0.7	U		16		
MD-01-64.10-VOC	MD-01	60.5 -65.5	64.1	64.2	64.15	Duncannon formation	BET	HF	0.8	U		8.4	U		8.4	U		0.8	U		0.84	U		0.8	U		8.4	U		0.8	U		5.9		
MD-01-64.80-VOC	MD-01	60.5 -65.5	64.8	64.9	64.85	Duncannon formation	AF	HF	1.0	U		10	U		10	U		1.0	U		1.0	U		1.0	U		10	U		1.0	U		12		
MD-01-66.30-VOC	MD-01	65.5 - 70.5	66.3	66.4	66.35	Duncannon formation	BF	HF	0.7	U		7.3	U		7.3	U		0.7	U		0.73	U		0.7	U		7.3	U		0.7	U		3.4		
MD-01-66.90-VOC	MD-01	65.5 - 70.5	66.9	67	66.95	Duncannon formation	BF	HF	0.9	U		9.2	U		9.2	U		0.9	U		0.92	U		0.9	U		9.2	U		0.9	U		7.2		
MD-01-68.40-VOC	MD-01	65.5 - 70.5	68.4	68.5	68.45	Duncannon formation	F4	NA	1.8	U		18	U		18	U		1.8	U		1.8	U		1.8	U		18	U		1.8	U		14		
MD-01-69.30-VOC	MD-01	65.5 - 70.5	69.3	69.4	69.35	Duncannon formation	BET	HF	1.3	U		13	U		13	U		1.3	U		1.3	U		1.3	U		13	U		1.3	U		3.1		
MD-01-70.00-VOC	MD-01	65.5 - 70.5	70	70.1	70.05	Duncannon formation	BF	ANG	1.2	U		12	U		12	U		1.2	U		1.2	U		1.2	U		12	U		1.2	U		1.6		
MD-01-71.60-VOC	MD-01	70.5 -75.5	71.6	71.7	71.65	Duncannon formation	BF	HF	0.7	U		6.7	U		6.7	U		0.7	U		0.67	U		0.7	U		6.7	U		0.7	U		2.7		
MD-01-72.30-VOC	MD-01	70.5 -75.5	72.3	72.4	72.35	Duncannon formation	BF	HF	1.0	U		9.5	U		9.5	U		1.0	U		0.95	U		1.0	U		9.5	U		1.0	U		0.7	J	
MD-01-73.20-VOC	MD-01	70.5 -75.5	73.2	73.3	73.25	Duncannon formation	NA	NA	0.8	U		8.3	U		8.3	U		0.8	U		0.83	U		0.8	U		8.3	U		0.8	U		0.8	U	
MD-01-75.10-VOC	MD-01	70.5 -75.5	75.1	75.2	75.15	Duncannon formation	BF	HF	0.9	U		8.9	U		8.9	U		0.9	U		0.89	U		0.9	U		8.9	U		0.9	U		0.9	U	
MD-01-76.10-VOC	MD-01	75.5 - 80.5	76.1	76.2	76.15	Duncannon formation	BF	HF	0.7	U		7.1	U		7.1	U		0.7	U		0.71	U		0.7	U		7.1	U		0.7	U		0.7	U	
MD-01-76.00-VOC	MD-01	75.5 - 80.5	76	76.1	76.05	Duncannon formation	BF	HF	0.8	U		7.6	U		7.6	U		0.8	U		0.76	U		0.8	U		7.6	U		0.8	U		0.8	U	
MD-01-78.40-VOC	MD-01	75.5 - 80.5	78.4	78.5	78.45	Duncannon formation	BET	HF	0.9	U		9.4	U		9.4	U		0.9	U		0.94	U		0.9	U		9.4	U		0.9	U		0.9	U	

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Table 4: Total VOC Concentrations in Rock Core Samples

						Comments/Interpretation			[VOLATILE ORGANIC COMPOUNDS IN ROCK] (ug/kg of rock)																	
			Depth from	Depth to	Avg. Depth																					
Sample ID	Location ID	Interval (ft bgs)	ft	ft	(ft bgs)	Sample Lithology (3a)	Position Relative to Fracturing (3b)	Fracture Type (3c)	Tetrachloroethene		cis-1,2-Dichloroethene		*trans-1,2-Dichloroethene*		*Carbon Tetrachloride*		Chloroform		1,1,1-Trichloroethane		1,1-Dichloroethene		1,1,2-Trichlor-1,2,2-Trifluoroethane		Trichloroethene	
MD-01-79.10-VOC	MD-01	75.5 - 80.5	79.1	79.2	79.15	Duncannon formation	BF	HF	1.3	U	13	U	13	U	1.3	U	1.3	U	1.3	U	13	U	1.3	U	1.3	U
MD-01-80.80-VOC	MD-01	80.5 - 85.5	80.8	80.9	80.85	Duncannon formation	BF	HF	1.1	U	11	U	11	U	1.1	U	1.1	U	1.1	U	11	U	1.1	U	1.1	U
MD-01-81.80-VOC	MD-01	80.5 - 85.5	81.8	81.9	81.85	Duncannon formation	AF	HF	2.0	U	20	U	20	U	2.0	U	2.0	U	2.0	U	20	U	2.0	U	2.0	U
MD-01-83.60-VOC	MD-01	80.5 - 85.5	83.6	83.7	83.65	Duncannon formation	F20	NA	1.2	U	12	U	12	U	1.2	U	1.2	U	1.2	U	12	U	1.2	U	1.2	U
MD-01-85.10-VOC	MD-01	80.5 - 85.5	85.1	85.2	85.15	Duncannon formation	AF	HF	1.0	U	9.7	U	9.7	U	1.0	U	0.97	U	1.0	U	9.7	U	1.0	U	1.0	U
MD-01-86.80-VOC	MD-01	85.5 -90.5	86.8	86.9	86.85	Duncannon formation	BF	HF	0.9	U	9.2	U	9.2	U	0.9	U	0.92	U	0.9	U	9.2	U	0.9	U	0.9	U
MD-01-87.70-VOC	MD-01	85.5 -90.5	87.7	87.8	87.75	Duncannon formation	BF	HF	1.0	U	10	U	10	U	1.0	U	1.0	U	1.0	U	10	U	1.0	U	1.0	U
MD-01-88.50-VOC	MD-01	85.5 -90.5	88.5	88.6	88.55	Duncannon formation	F12	NA	1.5	U	15	U	15	U	1.5	U	1.5	U	1.5	U	15	U	1.5	U	1.5	U
MD-01-89.50-VOC	MD-01	85.5 -90.5	89.5	89.6	89.55	Duncannon formation	AF	HF	0.8	U	8.0	U	8.0	U	0.8	U	0.80	U	0.8	U	8.0	U	0.8	U	0.8	U
MD-01-91.10-VOC	MD-01	90.5 -95.0	91.1	91.2	91.15	Duncannon formation	F12	NA	0.9	U	8.6	U	8.6	U	0.9	U	0.86	U	0.9	U	8.6	U	0.9	U	0.9	U
MD-01-92.40-VOC	MD-01	90.5 -95.0	92.4	92.5	92.45	Duncannon formation	F24	NA	1.1	U	11	U	11	U	1.1	U	1.1	U	1.1	U	11	U	1.1	U	1.1	U
MD-01-93.40-VOC	MD-01	90.5 -95.0	93.4	93.5	93.45	Duncannon formation	F12	NA	0.7	U	7.3	U	7.3	U	0.7	U	0.73	U	0.7	U	7.3	U	0.7	U	0.7	U

Notes:

1. This table presents data recorded in conducting field sampling and laboratory analysis of rock core samples from one coring location designated MD-01. The rock core drilling was conducted by Parratt-Wolff, Inc. and was observed and logged by TetraTech, Inc. personnel on 8/23/2011. The samples were collected, processed and preserved in the field by Stone Environmental Inc. (Stone) personnel then transported under COC to Stone's fixed lab in Barre, VT where they were extracted and analyzed for the listed target Volatile Organic Compounds (VOCs) using methods developed by the University of Guelph. Refer to the Stone report text and tables for additional details regarding sampling, sample preparation, extraction, and analysis.

2. Field sampling information includes corehole location, the depth interval of each nominally five-foot core run, and the sample depth in feet from ground surface.

3. The Comments/Interpretation section include general notes regarding the sample characteristics, field classified lithology, position relative to fracturing, and type of fracturing according to Stone standard protocols as explained further below.
   a) Lithology includes Brunswick Shale and reflect Stone and CDM personnel classification of the sample at the time of collection.
   b) Position relative to fracturing indicates the position of the sample relative to observed fractures inferred to reflect insitu features with the following legend:
   "bet"= between closely spaced fractures; "af"=above fracture surface; "bf"=below fracture surface; "bkn"=broken or crumbled region; "##" = sampled distance in tenths of feet from fracture surface.
   c) Fracture type denotes relative orientation of fracture relative to the axis of the core with "hf" denoting a horizontal fracture, "vf" a nominally vertical fracture, "ang" an angled fracture, "bkn" a highly fractured/broken zone, and "mech" a mechanical (drilling induced) break, respectively.

4. The laboratory results for volatile organic compounds in rock are expressed in units of micrograms per kilogram (ug/kg) of rock sample at field moisture conditions at the time of sampling for the target compounds including: tetrachloroethene (PCE), cis-1,2-dichloroethene (cis-DCE), trans-1,2-dichloroethene (trans-DCE), carbon tetrachloride (CT), chloroform (CF), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethene (1,1-DCE), 1,1,2-trichlor-1,2,2-trifluoroethane (CFC-113), and trichloroethene (TCE). The values are rounded to two significant figures. "ND" denotes that the compound was not detected, please refer to the report text and appendices for information regarding detection and quantitation limits. The second colum for each compound denotes quality assurance flags including: "U" denoting that a compound was not detected above the method detection limit (MDL); "J" indicated an approximate concentration between the compound and sample-specific MDL and Limit of Quantitation (LOQ) or Reporting Limit (RL); "B" indicates the concentration is suspect since the compound was detected within a factor of five (based on EPA rule for data validation) in an associated laboratory blank or due to GC carryover (reporting limit elevated); "R" denotes sample result rejected due to chromatographic interference causing inadequate peak separation or resolution or other deficiency in data generation process.

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Table 5: Estimated Porewater Concetrations - ug/L Pore Water

						Comments/Interpretation			Estimated Pore Water Concentration (ug/L)																			
			Depth from	Depth to	Avg. Depth																							
Sample ID	Location ID	Interval (ft bgs)	ft	ft	(ft bgs)	Sample Lithology (3a)	Position Relative to Fracturing (3b)	Fracture Type (3c)	Tetrachloroethene		cis-1,2-Dichloroethene		*trans-1,2-Dichloroethene*		*Carbon Tetrachloride*		Chloroform		1,1,1-Trichloroethane		1,1-Dichloroethene		1,1,2-Trichlor-1,2,2-Trifluoroethane		Trichloroethene	
									364	mL/g	86	mL/g	*59*	mL/g	*439*	mL/g	44	mL/g	152	mL/g	65	mL/g	372	mL/g	126	mL/g
MD-01-43.80-VOC	MD-01	43.5 - 45.5	43.8	43.9	43.85	Duncannon formation	AF	HF	5.8	U	180	U	220	U	4.9	U	26	U	12	U	210	U	5.7	U	1100	
MD-01-44.40-VOC	MD-01	43.5 - 45.5	44.4	44.5	44.45	Duncannon formation	BET	HF	4.3	U	130	U	170	U	3.7	U	19	U	8.9	U	160	U	4.3	U	4400	
MD-01-46.10-VOC	MD-01	45.5 - 50.5	46.1	46.2	46.15	Duncannon formation	BET	NA	4.9	U	150	U	190	U	4.2	U	22	U	10	U	180	U	4.8	U	1000	
MD-01-46.90-VOC	MD-01	45.5 - 50.5	46.9	47	46.95	Duncannon formation	AF	HF	4	U	120	U	150	U	3.4	U	18	U	8.2	U	150	U	3.9	U	610	
MD-01-47.70-VOC	MD-01	45.5 - 50.5	47.7	47.8	47.75	Duncannon formation	AF	HF	4.6	U	140	U	180	U	3.9	U	20	U	9.4	U	170	U	4.5	U	890	
MD-01-48.70-VOC	MD-01	45.5 - 50.5	48.7	48.7	48.70	Duncannon formation	BF	ANG	5.5	U	170	U	210	U	4.6	U	24	U	11	U	200	U	5.4	U	750	
MD-01-50.20-VOC	MD-01	45.5 - 50.5	50.2	50.3	50.25	Duncannon formation	AF	HF	5.4	U	170	U	210	U	4.6	U	24	U	11	U	200	U	5.3	U	1500	
MD-01-51.50-VOC	MD-01	50.5 - 55.5	51.5	51.6	51.55	Duncannon formation	AF	HF	5.2	U	160	U	200	U	4.4	U	23	U	11	U	190	U	5.1	U	610	
MD-01-52.80-VOC	MD-01	50.5 - 55.5	52.8	52.9	52.85	Duncannon formation	BF	ANG	4.6	U	140	U	180	U	3.9	U	20	U	9.4	U	170	U	4.5	U	540	
MD-01-53.50-VOC	MD-01	50.5 - 55.5	53.5	53.6	53.55	Duncannon formation	F3	NA	5.2	U	160	U	200	U	4.4	U	23	U	11	U	190	U	5.1	U	510	
MD-01-54.30-VOC	MD-01	50.5 - 55.5	54.3	54.4	54.35	Duncannon formation	AF	HF	6	U	180	U	230	U	5	U	27	U	12	U	220	U	5.8	U	390	
MD-01-56.50-VOC	MD-01	55.5 - 60.5	56.5	56.6	56.55	Duncannon formation	BF	HF	5.2	U	160	U	200	U	4.4	U	23	U	11	U	190	U	5.1	U	590	
MD-01-57.40-VOC	MD-01	55.5 - 60.5	57.4	57.5	57.45	Duncannon formation	BF	HF	4.6	U	140	U	180	U	3.9	U	21	U	9.6	U	170.0	U	4.6	U	930	
MD-01-58.40-VOC	MD-01	55.5 - 60.5	58.4	58.5	58.45	Duncannon formation	BET	HF	3.6	U	110	U	140	U	3.1	U	16	U	7.5	U	130	U	3.6	U	180	
MD-01-59.50-VOC	MD-01	55.5 - 60.5	59.5	59.6	59.55	Duncannon formation	F6	NA	4	U	120	U	150	U	3.4	U	18	U	8.2	U	150.0	U	3.9	U	210	
MD-01-60.00-VOC	MD-01	55.5 - 60.5	60	60.1	60.05	Duncannon formation	BF	HF	4.9	U	150	U	190	U	4.1	U	22	U	10	U	180	U	4.8	U	300	
MD-01-61.40-VOC	MD-01	60.5 -65.5	61.4	61.5	61.45	Duncannon formation	NA	NA	4.8	U	150	U	190	U	4.1	U	22	U	9.9	U	180	U	7		1000	
MD-01-62.50-VOC	MD-01	60.5 -65.5	62.5	62.6	62.55	Duncannon formation	BF	ANG	3.9	U	120	U	150	U	3.3	U	18	U	8.1	U	140	U	3.9	U	230	
MD-01-64.10-VOC	MD-01	60.5 -65.5	64.1	64.2	64.15	Duncannon formation	BET	HF	5	U	150	U	190	U	4.2	U	22	U	10	U	180	U	4.9	U	83	
MD-01-64.80-VOC	MD-01	60.5 -65.5	64.8	64.9	64.85	Duncannon formation	AF	HF	6	U	180	U	230	U	5	U	27	U	12	U	220	U	5.8	U	170	
MD-01-66.30-VOC	MD-01	65.5 - 70.5	66.3	66.4	66.35	Duncannon formation	BF	HF	4.3	U	130	U	170	U	3.7	U	19	U	8.9	U	160	U	4.3	U	48	
MD-01-66.90-VOC	MD-01	65.5 - 70.5	66.9	67	66.95	Duncannon formation	BF	HF	5.5	U	170	U	210	U	4.6	U	24	U	11	U	200	U	5.4	U	100	
MD-01-68.40-VOC	MD-01	65.5 - 70.5	68.4	68.5	68.45	Duncannon formation	F4	NA	11	U	330	U	410	U	9.1	U	48	U	22	U	390	U	11	U	200	
MD-01-69.30-VOC	MD-01	65.5 - 70.5	69.3	69.4	69.35	Duncannon formation	BET	HF	7.7	U	240	U	300	U	6.6	U	35	U	16	U	280	U	7.6	U	44	
MD-01-70.00-VOC	MD-01	65.5 - 70.5	70	70.1	70.05	Duncannon formation	BF	ANG	7.1	U	220	U	270	U	6	U	32	U	15	U	260	U	7	U	23.0	
MD-01-71.60-VOC	MD-01	70.5 -75.5	71.6	71.7	71.65	Duncannon formation	BF	HF	4.0	U	120	U	150	U	3.4	U	18	U	8.2	U	150	U	3.9	U	38	
MD-01-72.30-VOC	MD-01	70.5 -75.5	72.3	72.4	72.35	Duncannon formation	BF	HF	5.7	U	170	U	220	U	4.8	U	25	U	12	U	210	U	5.5	U	9.3	J
MD-01-73.20-VOC	MD-01	70.5 -75.5	73.2	73.3	73.25	Duncannon formation	NA	NA	4.9	U	150	U	190	U	4.2	U	22	U	10	U	180	U	4.8	U	12.0	U
MD-01-75.10-VOC	MD-01	70.5 -75.5	75.1	75.2	75.15	Duncannon formation	BF	HF	5.3	U	160	U	200	U	4.5	U	24	U	11	U	190	U	5.2	U	13	U
MD-01-76.10-VOC	MD-01	75.5 - 80.5	76.1	76.2	76.15	Duncannon formation	BF	HF	4.2	U	130	U	160	U	3.6	U	19	U	8.7	U	150	U	4.1	U	10	U
MD-01-76.00-VOC	MD-01	75.5 - 80.5	76	76.1	76.05	Duncannon formation	BF	HF	4.5	U	140	U	170	U	3.8	U	20	U	9.3	U	160	U	4.4	U	11	U

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Table 5: Estimated Porewater Concetrations - ug/L Pore Water

						Comments/Interpretation			Estimated Pore Water Concentration (ug/L)																							
			Depth from	Depth to	Avg. Depth																											
Sample ID	Location ID	Interval (ft bgs)	ft	ft	(ft bgs)	Sample Lithology (3a)	Position Relative to Fracturing (3b)	Fracture Type (3c)	Tetrachloroethene		cis-1,2-Dichloroethene		*trans-1,2-Dichloroethene*		*Carbon Tetrachloride*		Chloroform		1,1,1-Trichloroethane		1,1-Dichloroethene		1,1,2-Trichlor-1,2,2-Trifluoroethane		Trichloroethene	
MD-01-78.40-VOC	MD-01	75.5 - 80.5	78.4	78.5	78.45	Duncannon formation	BET	HF	5.6	U	170	U	210	U	4.7	U	25	U	12	U	200	U	5.5	U	13	U
MD-01-79.10-VOC	MD-01	75.5 - 80.5	79.1	79.2	79.15	Duncannon formation	BF	HF	7.7	U	240	U	300	U	6.6	U	35	U	16	U	280	U	7.6	U	18	U
MD-01-80.80-VOC	MD-01	80.5 - 85.5	80.8	80.9	80.85	Duncannon formation	BF	HF	6.6	U	200	U	250	U	5.5	U	29	U	13	U	240	U	6.4	U	15	U
MD-01-81.80-VOC	MD-01	80.5 - 85.5	81.8	81.9	81.85	Duncannon formation	AF	HF	12	U	370	U	460	U	10	U	53	U	25	U	430	U	12	U	28	U
MD-01-83.60-VOC	MD-01	80.5 - 85.5	83.6	83.7	83.65	Duncannon formation	F20	NA	7.1	U	220	U	270	U	6	U	32	U	15	U	260.0	U	7	U	17	U
MD-01-85.10-VOC	MD-01	80.5 - 85.5	85.1	85.2	85.15	Duncannon formation	AF	HF	5.8	U	180	U	220	U	4.9	U	26	U	12	U	210	U	5.7	U	14	U
MD-01-86.80-VOC	MD-01	85.5 -90.5	86.8	86.9	86.85	Duncannon formation	BF	HF	5.5	U	170	U	210	U	4.6	U	24	U	11	U	200	U	5.4	U	13	U
MD-01-87.70-VOC	MD-01	85.5 -90.5	87.7	87.8	87.75	Duncannon formation	BF	HF	6	U	180	U	230	U	5	U	27	U	12	U	220	U	5.8	U	14	U
MD-01-88.50-VOC	MD-01	85.5 -90.5	88.5	88.6	88.55	Duncannon formation	F12	NA	8.9	U	270	U	340	U	7.6	U	40	U	18	U	320	U	8.8	U	21	U
MD-01-89.50-VOC	MD-01	85.5 -90.5	89.5	89.6	89.55	Duncannon formation	AF	HF	4.8	U	150	U	180	U	4	U	21	U	9.8	U	170.0	U	4.7	U	11	U
MD-01-91.10-VOC	MD-01	90.5 -95.0	91.1	91.2	91.15	Duncannon formation	F12	NA	5.1	U	160	U	200	U	4.3	U	23	U	11	U	190	U	5	U	12	U
MD-01-92.40-VOC	MD-01	90.5 -95.0	92.4	92.5	92.45	Duncannon formation	F24	NA	6.6	U	200	U	250	U	5.5	U	29	U	13	U	240	U	6.4	U	15	U
MD-01-93.40-VOC	MD-01	90.5 -95.0	93.4	93.5	93.45	Duncannon formation	F12	NA	4.3	U	130	U	170	U	3.7	U	19	U	8.9	U	160	U	4.3	U	10	U

Notes:

1. This table presents data recorded in conducting field sampling and laboratory analysis of rock core samples from one coring location designated MD-01. The rock core drilling was conducted by Parratt-Wolff, Inc. and was observed and logged by TetraTech, Inc. personnel on 8/23/2011. The samples were collected, processed and preserved in the field by Stone Environmental Inc. (Stone) personnel then transported under COC to Stone's fixed lab in Barre, VT where they were extracted and analyzed for the listed target Volatile Organic Compounds (VOCs) using methods developed by the University of Guelph. Refer to the Stone report text and tables for additional details regarding sampling, sample preparation, extraction, and analysis.

2. Field sampling information includes corehole location, the depth interval of each nominally five-foot core run, and the sample depth in feet from ground surface.

3. The Comments/Interpretation section include general notes regarding the sample characteristics, field classified lithology, position relative to fracturing, and type of fracturing according to Stone standard protocols as explained further below.
   a) Lithology includes Brunswick Shale and reflect Stone and CDM personnel classification of the sample at the time of collection.
   b) Position relative to fracturing indicates the position of the sample relative to observed fractures inferred to reflect insitu features with the following legend:
   "bet"= between closely spaced fractures; "af"=above fracture surface; "bf"=below fracture surface; "bkn"=broken or crumbled region; "f#" = sampled distance in tenths of feet from fracture surface.
   c) Fracture type denotes relative orientation of fracture relative to the axis of the core with "hf" denoting a horizontal fracture, "vf" a nominally vertical fracture, "ang" an angled fracture, "bkn" a highly fractured/broken zone, and "mech" a mechanical (drilling induced) break, respectively.

4. The laboratory results for volatile organic compounds in rock are expressed in units of micrograms per kilogram (ug/kg) of rock sample at field moisture conditions at the time of sampling for the target compounds including: tetrachloroethene (PCE), cis-1,2-dichloroethene (cis-DCE), trans-1,2-dichloroethene (trans-DCE), carbon tetrachloride (CT), chloroform (CF), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethene (1,1-DCE), 1,1,2-trichlor-1,2,2-trifluoroethane (CFC-113), and trichloroethene (TCE). The values are rounded to two significant figures. "ND" denotes that the compound was not detected, please refer to the report text and appendices for information regarding detection and quantitation limits. The second colum for each compound denotes quality assurance flags including: "U" denoting that a compound was not detected above the method detection limit (MDL); "J" indicated an approximate concentration between the compound and sample-specific MDL and Limit of Quantitation (LOQ) or Reporting Limit (RL); "B" indicates the concentration is suspect since the compound was detected within a factor of five (based on EPA rule for data validation) in an associated laboratory blank or due to GC carryover (reporting limit elevated); "R" denotes sample result rejected due to chromatographic interference causing inadequate peak separation or resolution or other deficiency in data generation process.

5. The Estimated Pore Water Concentration in micrograms per liter (ug/L) represents an estimate of the equivalent matrix porewater concentrations (Cw) computed based on the laboratory determined total mass concentration (mg/g of wet rock), as outlined in the report text, using estimated or measured parameters including rock wet bulk density (g/cm3) as received in the field, matrix porosity, and matrix retardation factor (R). This simplified partitioning analysis assumes the rock matrix porosity was fully saturated with water, and that mass occurs at equilibrium in the dissolved and sorbed phase. Refer to the Stone report text for additional details.

Table 6: Summary of VOC Results for Field and Laboratory Blanks

Blank ID	Date Sampled	Date Analyzed	[VOLATILE ORGANIC COMPOUNDS IN METHANOL EXTRACT] (ug/L of MeOH)																Notes
			Tetrachloroethene		cis-1,2-Dichloroethene		trans-1,2-Dichloroethene		Carbon Tetrachloride		Chloroform		1,1,1-Trichloroethane		1,1-Dichloroethene		1,1,2-Trichlor-1,2,2-Trifluoroethane		Trichloroethene		
MB-1	8/23/2011	9/9/2011	2.0	U	20	U	20	U	2.0	U	2.0	U	2.0	U	20	U	2.0	U	2.0	U	
MB-2	8/23/2011	9/9/2011	2.0	U	20	U	20	U	2.0	U	2.0	U	2.0	U	20	U	2.0	U	2.0	U	
MD-01-EB-01	8/23/2011	9/9/2011	2.0	U	20	U	20	U	2.0	U	2.0	U	2.0	U	20	U	2.0	U	2.0	U	
MD-02-EB-02	8/23/2011	9/9/2011	2.0	U	20	U	20	U	2.0	U	2.0	U	2.0	U	20	U	2.0	U	2.0	U	
TB-01	8/23/2011	9/9/2011	2.0	U	20	U	20	U	2.0	U	2.0	U	2.0	U	20	U	2.0	U	2.0	U	
TB-02	8/23/2011	9/9/2011	2.0	U	20	U	20	U	3.1		2.0	U	2.0	U	20	U	2.0	U	2.0	U	Carbon Tetrachloride was not detected in any VOC sample, therefore this minor QC deficiency does not affect sample results

Notes:

The laboratory results for volatile organic compounds in rock are expressed in units of micrograms per liter (ug/L) of rock sample at field moisture conditions at the time of sampling for the target compounds including: tetrachloroethene (PCE), cis-1,2-dichloroethene (cis-DCE), trans-1,2-dichloroethene (trans-DCE), carbon tetrachloride (CT), chloroform (CF), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethene (1,1-DCE), 1,1,2-trichlor-1,2,2-trifluoroethane (CFC-113), and trichloroethene (TCE). The values are rounded to two significant figures. Please refer to the report text and appendices for information regarding detection and quantitation limits. The second colum for each compound denotes quality assurance flags including: "U" denoting that a compound was not detected above the method detection limit (MDL); "J" indicated an approximate concentration between the compound and sample-specific MDL and Limit of Quantitation (LOQ) or Reporting Limit (RL); "NA" denotes a calculation that is not available due to non detections. "EB" denotes equipment blank, "MB" denotes methanol blank, "TB" denotes trip blank.

Table 7: Summary of VOC Results for Field Duplicates

Sample ID	Total VOC Concentration (ug/kg) and Relative Percent Difference (%RPD)																		Notes
	Tetrachloroethene		cis-1,2-Dichloroethene		trans-1,2-Dichloroethene		Carbon Tetrachloride		Chloroform		1,1,1-Trichloroethane		1,1-Dichloroethene		1,1,2-Trichlor-1,2,2-Trifluoroethane		Trichloroethene		
MD-01-68.40-VOC	1.8	U	18	U	18	U	1.8	U	9.1	U	1.8	U	18	U	1.8	U	14		
MD-01-FD1-VOC	2.0	U	20	U	20	U	2.0	U	2.0	U	2.0	U	20	U	2.0	U	12	U	
%RPD	NA		NA		NA		NA		NA		NA		NA		NA		15%		
MD-01-86.80-VOC	0.92	U	9.2	U	9.2	U	0.92	U	4.6	U	0.92	U	9.2	U	0.92	U	0.92	U	
MD-01-FD2-VOC	0.91	U	9.1	U	9.1	U	0.91	U	0.91	U	0.91	U	9.1	U	0.91	U	0.91	U	
%RPD	NA		NA		NA		NA		NA		NA		NA		NA		NA		
MD-01-92.40-VOC	1.1	U	11	U	11	U	1.1	U	5.4	U	1.1	U	11	U	1.1	U	1.1	U	
MD-01-FD3-VOC	0.83	U	8.3	U	8.3	U	0.83	U	0.83	U	0.83	U	8.3	U	0.83	U	0.83	U	
%RPD	NA		NA		NA		NA		NA		NA		NA		NA		NA		

Notes:

The laboratory results for volatile organic compounds in rock are expressed in units of micrograms per kilogram (ug/kg) of rock sample at field moisture conditions at the time of sampling for the target compounds including: tetrachloroethene (PCE), cis-1,2-dichloroethene (cis-DCE), trans-1,2-dichloroethene (trans-DCE), carbon tetrachloride (CT), chloroform (CF), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethene (1,1-DCE), 1,1,2-trichlor-1,2,2-trifluoroethane (CFC-113), and trichloroethene (TCE). The values are rounded to two significant figures. Please refer to the report text and appendices for information regarding detection and quantitation limits. The second colum for each compound denotes quality assurance flags including: "U" denoting that a compound was not detected above the method detection limit (MDL); "J" indicated an approximate concentration between the compound and sample-specific MDL and Limit of Quantitation (LOQ) or Reporting Limit (RL); "NA" denotes a calculation that is not available due to non detections.

APPENDIX A: VOC ANALYTICAL REPORT

Final Data Report for Laboratory Services

PREPARED FOR TETRA TECH EC, INC.

SITE ID: MOUNTAIN TOP, PA

Stone Project ID 112347-R

REPORT DATE: September 13, 2011

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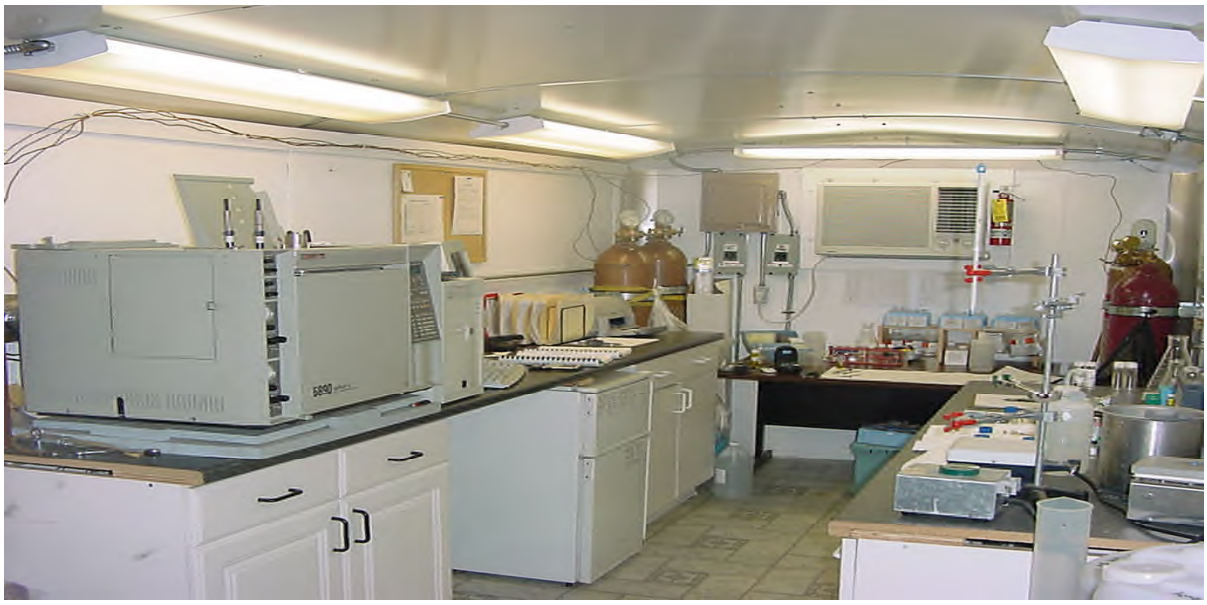
DEFENSIBLE REAL-TIME ANALYTICS



Prepared for:
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Prepared by:
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DEFENSIBLE REAL-TIME ANALYTICS

STONE ENVIRONMENTAL, INC. LABORATORY

NARRATIVE

September 13, 2011

This data package presents the analytical results for the rock samples analyzed by Stone Environmental, Inc. Laboratory (Stone Laboratory) in Bare, VT. Samples were collected at the Tetra Tech Site in Mountain Top, PA on August 23, 2011. These samples were transferred to Stone Laboratories by Stone staff on August 24, 2011.

Rock core samples were collected in the field in accordance with the rock core standard operating procedures (SOPs). Approximately 15-30 gram aliquots of rock at each depth were preserved in 15 ml methanol in the field and taken to the laboratory for analysis.

Samples were prepared for analysis by SOP SEI-10.17.0, "Microwave Assisted Extraction (MAE) of Volatile Organic Compounds from Rock Samples." All results are reported on a wet-weight basis on the analytical reporting forms. Subsequent to extraction, samples were analyzed by Stone according to SOP SEI-10.18.0, "The Determination of Volatile Organic Compounds By Gas Chromatography / Dual ECD Detectors in Rock Samples (Using Cool On Column Injection and Split Method Injection)" for chlorinated volatile organic compounds (VOCs).

Although this method is not provided under the NELAP fields of testing, the analytical results associated with the samples presented in this test report were generated under a quality system that adheres to requirements specified in the National Environmental Laboratory Accreditation Conference (NELAC) standards for standard methods as applicable. All quality assurance/quality control (QA/QC) measures associated with these analyses were found to be within the tolerance set forth in the associated laboratory Standard Operating Procedures (SOPS) and the NELAC standards.

When applicable, the final results were annotated with the following codes:

U - The analyte was analyzed for, but was not detected above the reported quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

B - Indicates the analyte was found in the associated laboratory blank as well as the sample.

I certify that the data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the laboratory manager or his designee, as verified by the following signature.

Sincerely yours,

Signature: 

(b) (4)
Laboratory Director

Direct Phone / 802.229.2194
E-Mail / mrossi@stone-env.com

SAMPLE LOGIN SUMMARY

Chain of Custody Records

Chain of Custody Record

STONE ENVIRONMENTAL INC

[redacted]
Phone / 802.229.4541
Fax / 802.229.5417
Web Site / www.stone-env.com

Project #: 102347-R
Project Name: TT Mountain Top
Project Manager: LJR/JAB
Site: Mountain Top, PA

Sample ID	Sample Type	Container Type	# Containers	Sample Date	Sample Time	Sample Preservative	VOC Extraction	Analyses Required	
MD-01-43.80-VOC	Rock VOC	40mL VOA	1	8/23/2011	09:12	MeOH	MAE	VOCs Rock	SE1-1
MD-01-44.40-VOC	Rock VOC	40mL VOA	1	8/23/2011	09:14	MeOH	MAE	VOCs Rock	SE1-2
MD-01-46.10-VOC	Rock VOC	40mL VOA	1	8/23/2011	09:40	MeOH	MAE	VOCs Rock	SE1-3
MD-01-46.90-VOC	Rock VOC	40mL VOA	1	8/23/2011	09:42	MeOH	MAE	VOCs Rock	SE1-4
MD-01-47.70-VOC	Rock VOC	40mL VOA	1	8/23/2011	09:44	MeOH	MAE	VOCs Rock	SE1-5
MD-01-48.70-VOC	Rock VOC	40mL VOA	1	8/23/2011	09:46	MeOH	MAE	VOCs Rock	SE1-6
MD-01-50.20-VOC	Rock VOC	40mL VOA	1	8/23/2011	09:48	MeOH	MAE	VOCs Rock	SE1-7
MD-01-51.50-VOC	Rock VOC	40mL VOA	1	8/23/2011	10:08	MeOH	MAE	VOCs Rock	SE1-8
MD-01-52.80-VOC	Rock VOC	40mL VOA	1	8/23/2011	10:10	MeOH	MAE	VOCs Rock	SE1-9
MD-01-53.50-VOC	Rock VOC	40mL VOA	1	8/23/2011	10:12	MeOH	MAE	VOCs Rock	SE1-10
MD-01-54.30-VOC	Rock VOC	40mL VOA	1	8/23/2011	10:15	MeOH	MAE	VOCs Rock	SE1-11
MD-01-56.50-VOC	Rock VOC	40mL VOA	1	8/23/2011	10:41	MeOH	MAE	VOCs Rock	SE1-12
MD-01-57.40-VOC	Rock VOC	40mL VOA	1	8/23/2011	10:43	MeOH	MAE	VOCs Rock	SE1-13
MD-01-58.40-VOC	Rock VOC	40mL VOA	1	8/23/2011	10:44	MeOH	MAE	VOCs Rock	SE1-14
MD-01-59.50-VOC	Rock VOC	40mL VOA	1	8/23/2011	10:46	MeOH	MAE	VOCs Rock	SE1-15
MD-01-60.00-VOC	Rock VOC	40mL VOA	1	8/23/2011	10:49	MeOH	MAE	VOCs Rock	SE1-16
MD-01-61.40-VOC	Rock VOC	40mL VOA	1	8/23/2011	11:20	MeOH	MAE	VOCs Rock	SE1-17

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Sample ID	Sample Type	Container Type	# Containers	Sample Date	Sample Time	Sample Preservative	VOC Extraction	Analyses Required	
MD-01-62.50-VOC	Rock VOC	40mL VOA	1	8/23/2011	11:23	MeOH	MAE	VOCs Rock	SC1-18
MD-01-64.10-VOC	Rock VOC	40mL VOA	1	8/23/2011	11:27	MeOH	MAE	VOCs Rock	SC1-19
MD-01-64.80-VOC	Rock VOC	40mL VOA	1	8/23/2011	11:30	MeOH	MAE	VOCs Rock	SC1-20
MD-01-66.30-VOC	Rock VOC	40mL VOA	1	8/23/2011	11:50	MeOH	MAE	VOCs Rock	SC1-21
MD-01-66.90-VOC	Rock VOC	40mL VOA	1	8/23/2011	11:54	MeOH	MAE	VOCs Rock	SC1-22
MD-01-68.40-VOC	Rock VOC	40mL VOA	1	8/23/2011	11:55	MeOH	MAE	VOCs Rock	SC1-23
MD-01-69.30-VOC	Rock VOC	40mL VOA	1	8/23/2011	11:59	MeOH	MAE	VOCs Rock	SC1-27
MD-01-70.00-VOC	Rock VOC	40mL VOA	1	8/23/2011	12:03	MeOH	MAE	VOCs Rock	SC1-28
MD-01-68.40-MS	Rock VOC	40mL VOA	1	12/30/1899	11:57	MeOH	MAE	VOCs Rock	SC1-23-MS
MD-01-68.40-MSD	Rock VOC	40mL VOA	1	12/30/1899	11:58	MeOH	MAE	VOCs Rock	SC1-23-MSD
MD-01-71.60-VOC	Rock VOC	40mL VOA	1	8/23/2011	13:30	MeOH	MAE	VOCs Rock	SC1-29
MD-01-72.30-VOC	Rock VOC	40mL VOA	1	8/23/2011	13:32	MeOH	MAE	VOCs Rock	SC1-30
MD-01-73.20-VOC	Rock VOC	40mL VOA	1	8/23/2011	13:34	MeOH	MAE	VOCs Rock	SC1-31
MD-01-75.10-VOC	Rock VOC	40mL VOA	1	8/23/2011	13:36	MeOH	MAE	VOCs Rock	SC1-32
MD-01-76.00-VOC	Rock VOC	40mL VOA	1	8/23/2011	13:59	MeOH	MAE	VOCs Rock	SC1-33 JAMS 34
MD-01-76.10-VOC	Rock VOC	40mL VOA	1	8/23/2011	13:57	MeOH	MAE	VOCs Rock	SC1-33
MD-01-78.40-VOC	Rock VOC	40mL VOA	1	8/23/2011	14:01	MeOH	MAE	VOCs Rock	SC1-35
MD-01-79.10-VOC	Rock VOC	40mL VOA	1	8/23/2011	14:03	MeOH	MAE	VOCs Rock	SC1-36
MD-01-80.80-VOC	Rock VOC	40mL VOA	1	8/23/2011	14:34	MeOH	MAE	VOCs Rock	SC1-37
MD-01-81.80-VOC	Rock VOC	40mL VOA	1	8/23/2011	14:35	MeOH	MAE	VOCs Rock	SC1-38
MD-01-83.60-VOC	Rock VOC	40mL VOA	1	8/23/2011	14:39	MeOH	MAE	VOCs Rock	SC1-39
MD-01-85.10-VOC	Rock VOC	40mL VOA	1	12/30/1899	14:42	MeOH	MAE	VOCs Rock	SC1-40
MD-01-86.80-VOC	Rock VOC	40mL VOA	1	12/30/1899	15:08	MeOH	MAE	VOCs Rock	SC1-41
MD-01-87.70-VOC	Rock VOC	40mL VOA	1	8/23/2011	15:12	MeOH	MAE	VOCs Rock	SC1-42

Sample ID	Sample Type	Container Type	# Containers	Sample Date	Sample Time	Sample Preservative	VOC Extraction	Analyses Required	
MD-01-88.50-MS	Rock VOC	40mL VOA	1	12/30/1899	15:14	MeOH	MAE	VOCs Rock	SE1-43-MS
MD-01-88.50-MSD	Rock VOC	40mL VOA	1	12/30/1899	15:16	MeOH	MAE	VOCs Rock	SE1-43-MSD
MD-01-88.50-VOC	Rock VOC	40mL VOA	1	12/30/1899	15:14	MeOH	MAE	VOCs Rock	SE1-43
MD-01-89.50-VOC	Rock VOC	40mL VOA	1	8/23/2011	15:18	MeOH	MAE	VOCs Rock	SE1-46
MD-01-91.10-VOC	Rock VOC	40mL VOA	1	8/23/2011	15:58	MeOH	MAE	VOCs Rock	SE1-47
MD-01-92.40-VOC	Rock VOC	40mL VOA	1	8/23/2011	16:01	MeOH	MAE	VOCs Rock	SE1-48
MD-01-93.40-VOC	Rock VOC	40mL VOA	1	8/23/2011	16:05	MeOH	MAE	VOCs Rock	SE1-49
MD-01-FD1-VOC	Rock VOC	40mL VOA	1	8/23/2011	11:56	MeOH	MAE	VOCs Rock	SE1-50 52.99
MD-01-FD2-VOC	Rock VOC	40mL VOA	1	8/23/2011	15:11	MeOH	MAE	VOCs Rock	SE1-51
MD-01-FD3-VOC	Rock VOC	40mL VOA	1	8/23/2011	16:01	MeOH	MAE	VOCs Rock	SE1-52

Relinquished By:	[redacted] (b) (4)	Date/Time: 8/23/11 1645	Sample Integrity: Good
Received By:		Date/Time: 8/24/11 0700	Temperature: -9.5
Relinquished By:		Date/Time: 8/24/11 1545	In Tact:
Received By:		Date/Time: 8/26/11 1200	On Ice: X Ice Packs:

- No Trip blank listed on chain, but in cooler

TB-02 → SE1-53

8

Chain of Custody Record

STONE ENVIRONMENTAL INC
Phone / 802.229.4541
Fax / 802.229.5417
Web Site / www.stone-env.com

Project #: 102347-R
Project Name: TT Mountain Top
Project Manager: LJR/JAB
Site: Mountain Top, PA

Sample ID	Sample Type	Container Type	# Containers	Sample Date	Sample Time	Sample Preservative	VOC Extraction	Analyses Required	
√ MD-01-EB-01	Equip Blank	40mL VOA	1	8/23/2011	08:41	MeOH	None	VOCs Rock	SG1-54
√ MD-01-EB-02	Equip Blank	40mL VOA	1	8/23/2011	13:33	MeOH	None	VOCs Rock	SG1-55
√ TB-01	Trip Blank	40mL VOA	1	8/23/2011	16:14	MeOH	None	VOCs Rock	SG1-56
√ MB-1	MeOH Blank	40mL VOA	1	8/23/2011	08:26	MeOH	None	VOCs Rock	SG1-58
√ MB-2	MeOH Blank	40mL VOA	1	8/23/2011	08:27	MeOH	None	VOCs Rock	SG1-59

Relinquished By:	(b) (4)	Date/Time: 5/23/11 1645	Sample Integrity: Good
Received By:		Date/Time: 5/24/11 0700	Temperature: -9.5
Relinquished By:		Date/Time: 5/24/11 1545	In Tact: Yes
Received By:		Date/Time: 5/26/11 1200	On Ice: X Ice Packs:

MD-01-EB-03 - Not on chain, but in cooler SG1-57

LABORATORY ANALYTICAL RESULTS

Laboratory Results - Rock Laboratory

Client:	Tetra Tech EC, Inc.	**Report Date:**	9/13/2011
Location:	Mountain Top, PA	**Date(s) Sampled:**	08/23/2011
Project ID:	TetraTech, Mountain Top PA	**Date(s) Analyzed:**	09/09/2011
SEI Project No.:	10-2347-R	**Test Method:**	GC/ECD
Matrix:	Rock	**Results Given as:**	ug/L of methanol
Location ID:	MD-01-1		

All of the tests results were performed in accordance with the NELAC standards and meet all NELAC requirements for parameters for which accreditation is required or available. The reports were completed according to contract specific reporting requirements. Any exceptions to the NELAC standard requirements are noted and the data has been qualified accordingly.

Depth		001.00		002.00		003.00		004.00		005.00		006.00		007.00			
Sample Name	CAS #	MB-1		MB-2		TB-01		TB-02		MD-01-EB-01		MD-01-EB-02		MD-01-EB-03			
Analysis Date		9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N		
1,1-Dichloroethene	75-35-4	20	U	20	U	20	U	20	U	20	U	20	U	20	U		
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U		
trans-1,2-Dichloroethene	156-60-5	20	U	20	U	20	U	20	U	20	U	20	U	20	U		
cis-1,2-Dichloroethene	156-59-2	20	U	20	U	20	U	20	U	20	U	20	U	20	U		
Chloroform	67-66-3	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U		
Carbon Tetrachloride	56-23-5	2.0	U	2.0	U	2.0	U	3.1		2.0	U	2.0	U	2.0	U		
1,1,1-Trichloroethane	71-55-6	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U		
Trichloroethene	79-01-6	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U		
Tetrachloroethene	127-18-4	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U		

Laboratory Results - Rock Laboratory

Client:	Tetra Tech EC, Inc.	**Report Date:**	9/13/2011
Location:	Mountain Top, PA	**Date(s) Sampled:**	08/23/2011
Project ID:	TetraTech, Mountain Top PA	**Date(s) Analyzed:**	09/07/2011
SEI Project No.:	10-2347-R	**Test Method:**	GC/ECD
Matrix:	Rock	**Results Given as:**	ug/kg
Location ID:	MD-01-2		

All of the tests results were performed in accordance with the NELAC standards and meet all NELAC requirements for parameters for which accreditation is required or available. The reports were completed according to contract specific reporting requirements. Any exceptions to the NELAC standard requirements are noted and the data has been qualified accordingly.

Depth		043.80		044.40		046.10		046.90		047.70		048.70		050.20		051.50	
Sample Name	CAS #	MD-01-43.80-VOC		MD-01-44.40-VOC		MD-01-46.10-VOC		MD-01-46.90-VOC		MD-01-47.70-VOC		MD-01-48.70-VOC		MD-01-50.20-VOC		MD-01-51.50-VOC	
Analysis Date		9/7/2011	N	9/7/2011	N	9/7/2011	N	9/7/2011	N	9/7/2011	N	9/7/2011	N	9/7/2011	N	9/7/2011	N
1,1-Dichloroethene	75-35-4	9.7	U	7.3	U	8.3	U	6.7	U	7.7	U	9.2	U	9.1	U	8.8	U
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	0.97	U	0.73	U	0.83	U	0.67	U	0.77	U	0.92	U	0.91	U	0.88	U
trans-1,2-Dichloroethene	156-60-5	9.7	U	7.3	U	8.3	U	6.7	U	7.7	U	9.2	U	9.1	U	8.8	U
cis-1,2-Dichloroethene	156-59-2	9.7	U	7.3	U	8.3	U	6.7	U	7.7	U	9.2	U	9.1	U	8.8	U
Chloroform	67-66-3	0.97	U	0.73	U	0.83	U	0.67	U	0.77	U	0.92	U	0.91	U	0.88	U
Carbon Tetrachloride	56-23-5	0.97	U	0.73	U	0.83	U	0.67	U	0.77	U	0.92	U	0.91	U	0.88	U
1,1,1-Trichloroethane	71-55-6	0.97	U	0.73	U	0.83	U	0.67	U	0.77	U	0.92	U	0.91	U	0.88	U
Trichloroethene	79-01-6	80		310		72		43		63		53		110		43	
Tetrachloroethene	127-18-4	0.97	U	0.73	U	0.83	U	0.67	U	0.77	U	0.92	U	0.91	U	0.88	U

Laboratory Results - Rock Laboratory

Client:	Tetra Tech EC, Inc.	**Report Date:**	9/13/2011
Location:	Mountain Top, PA	**Date(s) Sampled:**	08/23/2011
Project ID:	TetraTech, Mountain Top PA	**Date(s) Analyzed:**	09/07/2011
SEI Project No.:	10-2347-R	**Test Method:**	GC/ECD
Matrix:	Rock	**Results Given as:**	ug/kg
Location ID:	MD-01-3		

All of the tests results were performed in accordance with the NELAC standards and meet all NELAC requirements for parameters for which accreditation is required or available. The reports were completed according to contract specific reporting requirements. Any exceptions to the NELAC standard requirements are noted and the data has been qualified accordingly.

Depth		052.80		053.50		054.30		056.50		057.40		058.40		059.50		060.00	
Sample Name	CAS #	MD-01-52.80-VOC		MD-01-53.50-VOC		MD-01-54.30-VOC		MD-01-56.50-VOC		MD-01-57.40-VOC		MD-01-58.40-VOC		MD-01-59.50-VOC		MD-01-60.00-VOC	
Analysis Date		9/7/2011	N	9/7/2011	N	9/7/2011	N	9/7/2011	N	9/7/2011	N	9/8/2011	N	9/8/2011	N	9/8/2011	N
1,1-Dichloroethene	75-35-4	7.7	U	8.7	U	10	U	8.7	U	7.8	U	6.1	U	6.7	U	8.2	U
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	0.77	U	0.87	U	1.0	U	0.87	U	0.78	U	0.61	U	0.67	U	0.82	U
trans-1,2-Dichloroethene	156-60-5	7.7	U	8.7	U	10	U	8.7	U	7.8	U	6.1	U	6.7	U	8.2	U
cis-1,2-Dichloroethene	156-59-2	7.7	U	8.7	U	10	U	8.7	U	7.8	U	6.1	U	6.7	U	8.2	U
Chloroform	67-66-3	0.77	U	0.87	U	1.0	U	0.87	U	0.78	U	0.61	U	0.67	U	0.82	U
Carbon Tetrachloride	56-23-5	0.77	U	0.87	U	1.0	U	0.87	U	0.78	U	0.61	U	0.67	U	0.82	U
1,1,1-Trichloroethane	71-55-6	0.77	U	0.87	U	1.0	U	0.87	U	0.78	U	0.61	U	0.67	U	0.82	U
Trichloroethene	79-01-6	38		36		28		42		66		13		15		21	
Tetrachloroethene	127-18-4	0.77	U	0.87	U	1.0	U	0.87	U	0.78	U	0.61	U	0.67	U	0.82	U

Laboratory Results - Rock Laboratory

Client:	Tetra Tech EC, Inc.	**Report Date:**	9/13/2011
Location:	Mountain Top, PA	**Date(s) Sampled:**	08/23/2011
Project ID:	TetraTech, Mountain Top PA	**Date(s) Analyzed:**	09/08/2011
SEI Project No.:	10-2347-R	**Test Method:**	GC/ECD
Matrix:	Rock	**Results Given as:**	ug/kg
Location ID:	MD-01-4		

All of the tests results were performed in accordance with the NELAC standards and meet all NELAC requirements for parameters for which accreditation is required or available. The reports were completed according to contract specific reporting requirements. Any exceptions to the NELAC standard requirements are noted and the data has been qualified accordingly.

Depth		061.40		062.50		064.10		064.80		066.30		066.90					
Sample Name	CAS #	MD-01-61.40-VOC		MD-01-62.50-VOC		MD-01-64.10-VOC		MD-01-64.80-VOC		MD-01-66.30-VOC		MD-01-66.90-VOC					
Analysis Date		9/8/2011	N	9/8/2011	N	9/8/2011	N	9/8/2011	N	9/8/2011	N	9/8/2011	N				
1,1-Dichloroethene	75-35-4	8.1	U	6.6	U	8.4	U	10	U	7.3	U	9.2	U				
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.2		0.66	U	0.84	U	1.0	U	0.73	U	0.92	U				
trans-1,2-Dichloroethene	156-60-5	8.1	U	6.6	U	8.4	U	10	U	7.3	U	9.2	U				
cis-1,2-Dichloroethene	156-59-2	8.1	U	6.6	U	8.4	U	10	U	7.3	U	9.2	U				
Chloroform	67-66-3	0.81	U	0.66	U	0.84	U	1.0	U	0.73	U	0.92	U				
Carbon Tetrachloride	56-23-5	0.81	U	0.66	U	0.84	U	1.0	U	0.73	U	0.92	U				
1,1,1-Trichloroethane	71-55-6	0.81	U	0.66	U	0.84	U	1.0	U	0.73	U	0.92	U				
Trichloroethene	79-01-6	71		16		5.9		12		3.4		7.2					
Tetrachloroethene	127-18-4	0.81	U	0.66	U	0.84	U	1.0	U	0.73	U	0.92	U				

Laboratory Results - Rock Laboratory

Client:	Tetra Tech EC, Inc.	**Report Date:**	9/13/2011
Location:	Mountain Top, PA	**Date(s) Sampled:**	08/23/2011
Project ID:	TetraTech, Mountain Top PA	**Date(s) Analyzed:**	09/09/2011
SEI Project No.:	10-2347-R	**Test Method:**	GC/ECD
Matrix:	Rock	**Results Given as:**	ug/kg
Location ID:	MD-01-5		

All of the tests results were performed in accordance with the NELAC standards and meet all NELAC requirements for parameters for which accreditation is required or available. The reports were completed according to contract specific reporting requirements. Any exceptions to the NELAC standard requirements are noted and the data has been qualified accordingly.

Depth		068.40		069.30		070.00		071.60		072.30		073.20		076.00		075.10	
Sample Name	CAS #	MD-01-68.40-VOC		MD-01-69.30-VOC		MD-01-70.00-VOC		MD-01-71.60-VOC		MD-01-72.30-VOC		MD-01-73.20-VOC		MD-01-76.00-VOC		MD-01-75.10-VOC	
Analysis Date		9/8/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N
1,1-Dichloroethene	75-35-4	18	U	13	U	12	U	6.7	U	9.5	U	8.3	U	7.1	U	8.9	U
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.8	U	1.3	U	1.2	U	0.67	U	0.95	U	0.83	U	0.71	U	0.89	U
trans-1,2-Dichloroethene	156-60-5	18	U	13	U	12	U	6.7	U	9.5	U	8.3	U	7.1	U	8.9	U
cis-1,2-Dichloroethene	156-59-2	18	U	13	U	12	U	6.7	U	9.5	U	8.3	U	7.1	U	8.9	U
Chloroform	67-66-3	1.8	U	1.3	U	1.2	U	0.67	U	0.95	U	0.83	U	0.71	U	0.89	U
Carbon Tetrachloride	56-23-5	1.8	U	1.3	U	1.2	U	0.67	U	0.95	U	0.83	U	0.71	U	0.89	U
1,1,1-Trichloroethane	71-55-6	1.8	U	1.3	U	1.2	U	0.67	U	0.95	U	0.83	U	0.71	U	0.89	U
Trichloroethene	79-01-6	14		3.1		1.6		2.7		0.66	J	0.83	U	0.71	U	0.89	U
Tetrachloroethene	127-18-4	1.8	U	1.3	U	1.2	U	0.67	U	0.95	U	0.83	U	0.71	U	0.89	U

Laboratory Results - Rock Laboratory

Client:	Tetra Tech EC, Inc.	**Report Date:**	9/13/2011
Location:	Mountain Top, PA	**Date(s) Sampled:**	08/23/2011
Project ID:	TetraTech, Mountain Top PA	**Date(s) Analyzed:**	09/09/2011
SEI Project No.:	10-2347-R	**Test Method:**	GC/ECD
Matrix:	Rock	**Results Given as:**	ug/kg
Location ID:	MD-01-6		

All of the tests results were performed in accordance with the NELAC standards and meet all NELAC requirements for parameters for which accreditation is required or available. The reports were completed according to contract specific reporting requirements. Any exceptions to the NELAC standard requirements are noted and the data has been qualified accordingly.

Depth		076.10		078.40		079.10		080.80		081.80		083.60		085.10		086.80	
Sample Name	CAS #	MD-01-76.10-VOC		MD-01-78.40-VOC		MD-01-79.10-VOC		MD-01-80.80-VOC		MD-01-81.80-VOC		MD-01-83.60-VOC		MD-01-85.10-VOC		MD-01-86.80-VOC	
Analysis Date		9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N
1,1-Dichloroethene	75-35-4	7.6	U	9.4	U	13	U	11	U	20	U	12	U	9.7	U	9.2	U
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	0.76	U	0.94	U	1.3	U	1.1	U	2.0	U	1.2	U	0.97	U	0.92	U
trans-1,2-Dichloroethene	156-60-5	7.6	U	9.4	U	13	U	11	U	20	U	12	U	9.7	U	9.2	U
cis-1,2-Dichloroethene	156-59-2	7.6	U	9.4	U	13	U	11	U	20	U	12	U	9.7	U	9.2	U
Chloroform	67-66-3	0.76	U	0.94	U	1.3	U	1.1	U	2.0	U	1.2	U	0.97	U	0.92	U
Carbon Tetrachloride	56-23-5	0.76	U	0.94	U	1.3	U	1.1	U	2.0	U	1.2	U	0.97	U	0.92	U
1,1,1-Trichloroethane	71-55-6	0.76	U	0.94	U	1.3	U	1.1	U	2.0	U	1.2	U	0.97	U	0.92	U
Trichloroethene	79-01-6	0.76	U	0.94	U	1.3	U	1.1	U	2.0	U	1.2	U	0.97	U	0.92	U
Tetrachloroethene	127-18-4	0.76	U	0.94	U	1.3	U	1.1	U	2.0	U	1.2	U	0.97	U	0.92	U

Laboratory Results - Rock Laboratory

Client:	Tetra Tech EC, Inc.	**Report Date:**	9/13/2011
Location:	Mountain Top, PA	**Date(s) Sampled:**	08/23/2011
Project ID:	TetraTech, Mountain Top PA	**Date(s) Analyzed:**	09/09/2011
SEI Project No.:	10-2347-R	**Test Method:**	GC/ECD
Matrix:	Rock	**Results Given as:**	ug/kg
Location ID:	MD-01-7		

All of the tests results were performed in accordance with the NELAC standards and meet all NELAC requirements for parameters for which accreditation is required or available. The reports were completed according to contract specific reporting requirements. Any exceptions to the NELAC standard requirements are noted and the data has been qualified accordingly.

Depth		087.70		088.50		089.50		091.10		092.40		093.40					
Sample Name	CAS #	MD-01-87.70-VOC		MD-01-88.50-VOC		MD-01-89.50-VOC		MD-01-91.10-VOC		MD-01-92.40-VOC		MD-01-93.40-VOC					
Analysis Date		9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N	9/9/2011	N				
1,1-Dichloroethene	75-35-4	10	U	15	U	8.0	U	8.6	U	11	U	7.3	U				
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.0	U	1.5	U	0.80	U	0.86	U	1.1	U	0.73	U				
trans-1,2-Dichloroethene	156-60-5	10	U	15	U	8.0	U	8.6	U	11	U	7.3	U				
cis-1,2-Dichloroethene	156-59-2	10	U	15	U	8.0	U	8.6	U	11	U	7.3	U				
Chloroform	67-66-3	1.0	U	1.5	U	0.80	U	0.86	U	1.1	U	0.73	U				
Carbon Tetrachloride	56-23-5	1.0	U	1.5	U	0.80	U	0.86	U	1.1	U	0.73	U				
1,1,1-Trichloroethane	71-55-6	1.0	U	1.5	U	0.80	U	0.86	U	1.1	U	0.73	U				
Trichloroethene	79-01-6	1.0	U	1.5	U	0.80	U	0.86	U	1.1	U	0.73	U				
Tetrachloroethene	127-18-4	1.0	U	1.5	U	0.80	U	0.86	U	1.1	U	0.73	U				

Laboratory Results - Rock Laboratory

Client:	Tetra Tech EC, Inc.	**Report Date:**	9/13/2011
Location:	Mountain Top, PA	**Date(s) Sampled:**	08/23/2011
Project ID:	TetraTech, Mountain Top PA	**Date(s) Analyzed:**	09/09/2011
SEI Project No.:	10-2347-R	**Test Method:**	GC/ECD
Matrix:	Rock	**Results Given as:**	ug/kg
Location ID:	MD-01-f		

All of the tests results were performed in accordance with the NELAC standards and meet all NELAC requirements for parameters for which accreditation is required or available. The reports were completed according to contract specific reporting requirements. Any exceptions to the NELAC standard requirements are noted and the data has been qualified accordingly.

Depth		068.40		086.80		092.40											
Sample Name	CAS #	MD-01-FD1-VOC		MD-01-FD2-VOC		MD-01-FD3-VOC											
Analysis Date		9/9/2011	FD	9/9/2011	FD	9/9/2011	FD										
1,1-Dichloroethene	75-35-4	15	U	9.1	U	8.3	U										
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.5	U	0.91	U	0.83	U										
trans-1,2-Dichloroethene	156-60-5	15	U	9.1	U	8.3	U										
cis-1,2-Dichloroethene	156-59-2	15	U	9.1	U	8.3	U										
Chloroform	67-66-3	1.5	U	0.91	U	0.83	U										
Carbon Tetrachloride	56-23-5	1.5	U	0.91	U	0.83	U										
1,1,1-Trichloroethane	71-55-6	1.5	U	0.91	U	0.83	U										
Trichloroethene	79-01-6	12		0.91	U	0.83	U										
Tetrachloroethene	127-18-4	1.5	U	0.91	U	0.83	U										

APPENDIX B: PHYSICAL PROPERTY ANALYTICAL REPORT

Golder Associates

CELEBRATING 50 YEARS in 2010

September 19, 2011

Project No. 11-1183-0061

102347-R

(b) (4) [redacted]
Stone Environmental Inc.
535 Stone Cutters Way
Montpelier, Vermont
05602

GEOTECHNICAL LABORATORY TESTING

Dear Sir

This letter reports the results of laboratory testing carried out on the samples received at our office in Mississauga. The results of the tests are summarized in the attached tables and figures.

The testing services reported herein have been performed in accordance with the indicated recognized standard, unless noted otherwise. This report is for the sole use of the designated client. This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability.

We trust that the results are sufficient for your current requirements. If you have any questions, please do not hesitate to call us.

GOLDER ASSOCIATES LTD.

(b) (4) [redacted]

Laboratory Manager

MM/lg

DENSITY AND POROSITY DETERMINATIONS OF IRREGULAR SHAPE SAMPLES
ASTM D 4531-86 TEST METHOD B

Sample Number	MD-01-47.80-48.30-PHY	MD-01-73.90-74.40-PHY	MD-01-84.20-84.70-PHY	MD-01-88.50-89.00-PHY
Wet Mass of Rock in Air, g	636.15	704.15	347.82	513.60
Wet Mass of Rock + Wax in Air, g	649.60	715.30	356.94	522.50
Wet Mass of Rock + Wax in Water, g	390.62	445.20	217.70	316.36
Weight of Wax, g	13.45	11.15	9.12	8.90
Displaced Volume, cm^3	258.98	270.10	139.24	206.14
Displaced Wax, cm^3	14.81	12.28	10.04	9.80
Volume of Rock, cm^3	244.17	257.82	129.20	196.34
Specific Gravity, assumed	2.77	2.83	2.77	2.73
Volume of Solids, cm^3	222.75	244.90	125.07	187.57
Volume of Voids, cm^3	21.42	12.92	4.13	8.77
Porosity	0.09	0.05	0.03	0.04
Water Content, %	3.10	1.60	0.40	0.30
Unit Weight, kN/m^3	25.55	26.78	26.40	25.65
Dry Unit Weight, kN/m^3	24.78	26.36	26.30	25.58

Project Number	11-1183-0061	Tested By	Larry
Date Tested	9/16/2011	Checked By	

TOTAL ORGANIC CARBON CONTENT (TOC)

PROJECT NUMBER	11-1183-0061
PROJECT NAME	Stone / Lab Testing / 102347-R
DATE TESTED	September, 2011

Sample No.	Soil Passing 0.6mm (%)	Grain Size Distribution Passing Gravel (%)	Sand (%)	Silt (%)	Clay (%)	TOC <0.6mm (%)
MD-01-47.80-48.30-PHY	-	-	-	-	-	0.01
MD-01-73.90-74.40-PHY	-	-	-	-	-	0.06
MD-01-73.90-74.40-PHY (repeat)	-	-	-	-	-	0.01
MD-01-84.20-84.70-PHY	-	-	-	-	-	0.01
MD-01-88.50-89.00-PHY	-	-	-	-	-	0.11
MD-01-88.50-89.00-PHY (repeat)	-	-	-	-	-	0.11

Notes:

1. Samples dried at 110 degree centigrade prior to testing.
2. Test performed on whole rock crushed to minus 600 microns, using the method of Walkley and Black (Walkley, 1946)

Checked By: MM

Golder Associates

SPECIFIC GRAVITY TEST RESULTS

ASTM D 854-06 TEST METHOD A

PROJECT NUMBER	11-1183-0061
PROJECT NAME	Stone / Lab Testing / 102347-R
DATE TESTED	September, 2011

Sample No.	Specific Gravity
MD-01-47.80-48.30-PHY	2.77
MD-01-73.90-74.40-PHY	2.83
MD-01-84.20-84.70-PHY	2.77
MD-01-88.50-89.00-PHY	2.73

Note: Test carried out on soil particles <4.75mm using distilled water.

Checked By: MM

Golder Associates

SUMMARY OF WATER CONTENT DETERMINATIONS

ASTM D 2216-05

PROJECT NUMBER	11-1183-0061
PROJECT NAME	Stone / Lab Testing / 102347-R
DATE TESTED	September, 2011

Sample No.	Water Content (%)	Atterberg Limits LL, PL, PI
MD-01-47.80-48.30-PHY	3.1%	
MD-01-73.90-74.40-PHY	1.6%	
MD-01-84.20-84.70-PHY	0.4%	
MD-01-88.50-89.00-PHY	0.3%	

Checked By:

Golder Associates